The Park–Sasaki Method of Speed-Reading and Mindfulness: A Cross-Sectional Study

Hiromitsu MIYATA(1) · Toyofumi SASAKI(2)

Abstract

Contemplative training has been suggested to cause plastic changes not only to the function and structure of the brain, but also to perceived psychological status. Do such changes occur for meditation-based training methods intended to enhance higher cognitive capabilities such as reading? The Park–Sasaki method is a speed-reading method in Japan that involves visual training while trainees aim to form both a relaxed and concentrated mental state, comparable to meditation, to achieve higher reading speeds with comprehension. In the preset study, both speed-reading trainees and untrained participants completed questionnaires on mindfulness and relevant psychological status. Compared with the untrained participants, the trainees self-reported significantly higher scores on mindfulness, subjective well-being, positive affect, and empathy, and lower scores on depression. The trainees also self-reported higher daily reading speeds than the untrained participants, whereas daily reading time was statistically equivalent between the two groups. Furthermore, among the trainees, training period and self-reported reading speed were positively associated with mindfulness and subjective well-being, and daily reading time and speed were positively associated with positive affect. These correlations were less apparent for the untrained participants. The results of structural equation modeling were consistent with the view that speed-reading training led to higher mindfulness, which resulted in a more desirable psychological status. These results are generally parallel to those previously obtained for a population of Japanese yoga practitioners, and suggest that the effect of continued training on desirable psychological status is true for a contemplative method that aims to enhance higher intellectual capabilities such as reading. An important limitation of the study concerns the fact that the present study used a cross-sectional design, so that a longitudinal intervention study is essentially required at the forthcoming stage of enquiry in order to model the effect of speed-reading training on psychological and/or cognitive outcomes in more convincing ways.

Keywords: reading; training; mindfulness; well-being, psychological status

Introduction

An increasing amount of empirical evidence supporting the notion that contemplative practices based on Eastern traditions can cause plastic changes to attentional, affective, and somatic functions in adults has been accumulated in recent decades (for overviews, see Goyal et al., 2014; Lutz et al., 2008). In addition, the idea of mindfulness, or psychological processes of maintaining moment-by-moment attention to one's internal and external experiences in nonjudgmental ways (Kabat-Zinn, 1990; Segal et al., 2002), has been effectively applied in the context of stress reduction and the enhancement of psychological well-being (for recent reviews, see Creswell, 2017; Davis & Hayes, 2011). In clinical contexts, interventions such as mindfulness-based stress reduction (MBSR; Kabat-Zinn, 1990) and mindfulness-based cognitive therapy (MBCT; Segal et al., 2002) have proven effective in patients with chronic pain and depression. Among the samples of healthy participants and contemplatives, for example, yoga practitioners in Japan whose practice periods ranged from 0.3 to 34.0 years self-reported higher scores on mindful-

(1) Professor, Faculty of Letters, Arts and Sciences, Waseda University, Tokyo, Japan
(2) Chief Director, NBS Japan Society of Speed Reading Education, Tokyo, Japan

ness, subjective well-being, positive affect, and empathy, and lower scores on depression and negative affect compared with non-practitioners (Miyata et al., 2015). In addition, period and (to a lesser extent) amount of yoga/meditation practice were associated with higher mindfulness and subjective well-being and reduced depression and negative affect (Miyata et al., 2015).

Given such accumulated evidence, it seems worthwhile to ask whether and how meditation-based training can enhance cognitive capabilities that are crucial in daily life, such as reading. Studies on school education have suggested that mindful reading can enable students to use active and flexible strategies to organize, elaborate on, and evaluate text (Paris et al., 1991; Rhoder, 2002). For example, two-week mindfulness training has been reported to improve reading comprehension performance and working memory capacity while reducing mind wandering in undergraduate students (Mrazek et al., 2013). These data seem in agreement with the notion that skilled reading involves cognitive functions such as sustaining one's attention on the text and effectively monitoring one's own level of comprehension, which overlap with the core components of mindfulness, such as focused attention and self-observation (Baer et al., 2006; Kabat-Zinn, 1990). It should therefore be reasonable to assume that reading has similar psychological correlates to mindfulness and meditation. A preliminary study involving a large sample of Japanese non-meditators across a wide age range showed that self-reported reading time per day and (to a lesser extent) daily reading speed correlated positively with mindfulness and subjective well-being and negatively with depression and negative affect (Miyata, 2016).

The Park–Sasaki method is a speed-reading technique that originated in Korea and was further developed in Japan (Miyata, 2015; Sasaki, 1995). This method seems interesting in the research literature described above because the nature of its training can be referred to as "contemplative reading." Specifically, trainees of this method are first instructed to form a both relaxed and concentrated mental state by introducing various contemplative techniques, including *tanden kokyu* (breathing meditation while using the inner part of the lower abdomen; Muraki, 2001) and progressive muscle relaxation (Pawlow & Jones, 2002; 2005). The training then proceeds to the acquisition of a specific gazing strategy in which one shifts one's gazing foci from one point to the next without perceiving one's own eye movements. To achieve reading speeds faster than 10,000 Japanese characters per minute while maintaining acceptable levels of comprehension, the stimuli used for this training is altered in a step-by-step manner from geometrical figures such as circles and arrows to actual sentences and books.

Psychological and neurophysiological correlates of the Park–Sasaki speed-reading method have been investigated in recent decades (for a review, see Miyata, 2015). An earlier study using electroencephalogram data reported increased beta amplitudes in the right occipital areas (O2) during speed-reading, which suggested the utilization of visual images (Kawano & Sasaki, 2005). Using functional magnetic resonance imaging, Fujimaki et al. (2009) reported that speed-reading was associated with reduced cortical activation in the Broca's and Wernicke's areas and increased activation in the right intraparietal sulcus, each suggesting the use of fewer phonological processes and enhanced visuo-spatial processes (see also Fujimaki et al., 2004). A behavioral study introducing a visual search task found that speed-readers showed significantly shorter reaction times than untrained participants for both feature and conjunction search tasks (Kato et al., 2005). Miyata et al. (2012) developed a sentence comprehension task and found that a highly advanced speed-reader read contemporary Japanese novels 4.7 times faster than untrained participants (5,644 characters per minute), and showed statistically comparable comprehension scores. Eye-tracking data revealed that the expert moved her eyes along a horizontal straight line without gazing at all parts of the sentence display, in support of the notion that her effective visual field was widened as a result of the training (see also Miyata et al., 2016).

Despite these suggested perceptual, attentional, and neurocognitive changes associated with speed-reading, it remains unknown whether and how everyday psychological status may change as a result of continued training in speed-reading. Given that the Park–Sasaki method essentially involves components of contemplative practice, the training should be predicted to be associated with a desirable psychological status, comparable to those observed in yoga (Miyata et al., 2015). Therefore, the aim of the present cross-sectional study was to examine mindfulness and relevant psychological functions in trainees of the Park–Sasaki method of speed-reading who were at different stages of expertise, as well as in the untrained participants. As has been pointed out in studies on meditation and

other domains of expertise, both cross-sectional and longitudinal approaches are required to uncover sufficiently the effects of continued training (Miyata et al., 2015; Slagter et al., 2011). Specifically, cross-sectional studies are advantageous at the beginning stage of enquiry in that they can uncover psychological status in a large number of advanced and/or long-term trainees at a specific point of time. Outcomes from cross-sectional studies can also serve as a basis for conducting longitudinal studies to examine the effects of short- or middle-term interventions within the same sample. Based on previous findings from yoga (Miyata et al., 2015), we expected that the period of training and acquired skills regarding speed-reading would be associated with increased desirable psychological functions such as mindfulness, subjective well-being, positive affect, and empathy, and reduced non-desirable functions such as depression and negative affect.

Materials and Methods

Participants

Fifty-three healthy Japanese participants (17 females and 36 males; age range = 13–72 years; mean age = 43.4 years; standard deviation [*SD*] = 12.1) participated as trainees of the Park–Sasaki method of speed-reading. All these participants had started the regular training course of the Park–Sasaki method prior to this study. The chief instructor of this method (TS) solicited cooperation to participate in the survey at the speed-reading school located in Tokyo by handing the printed version of the questionnaire sheets to as many trainees as possible. All speed-reading trainees provided written informed consent on a separate sheet of paper upon agreement to cooperate.

One hundred untrained participants (32 females and 68 males; age range = 17–76 years; mean age = 45.2 years; *SD* = 12.3) were also included as controls. Untrained participants were healthy Japanese individuals who reported that they had not undergone training in speed-reading or practiced any other contemplative methods. Data for the untrained participants were collected using the "i Research" online survey system (NEO Marketing Inc., Tokyo, Japan). In this system, more than 3,270,000 Japanese monitors had provided their demographic and socioeconomic characteristics and agreed to cooperate in various questionnaire surveys conducted on the Internet. All untrained participants for the present survey were selected from these monitors so that their following demographic, socioeconomic, and other characteristics would match those of the speed-reading trainees: sex (32% females, 68% males), age range (2% teenagers, 11% in their twenties, 23% in their thirties, etc.), marital status (56% married, 44% unmarried), annual household income (4% below 2,000,000 Japanese yen, 25% between 2,000,000–4,990,000 yen, 41% between 5,000,000–8,990,000 yen, 30% above 9,000,000 yen), and other activities, i.e., whether the participant practiced any activities other than speed-reading, such as sports, art, or hobbies (75% yes, 25% no). Before starting the survey, all untrained participants checked a box on the Internet to indicate that they had agreed to cooperate. All participants from both groups had no prior experience with an identical questionnaire survey. Data for all participants from both groups were included in the analysis, except for those with missing data.

Measures and Procedure

All participants completed a battery of questionnaires as described below. The speed-reading trainees filled in paper-based questionnaires, while the untrained participants completed identical questionnaires online by checking a relevant box for each item. The survey for the untrained participants did not finish until each participant answered all the question items for the psychological scales. For these scales, all participants were clearly notified that the survey aimed to know only their daily psychological status, without intending to evaluate them. They were not informed that the study would compare the speed-reading trainees and untrained participants. Participants were also told that there were no good or bad answers for any of the items, and that they should therefore always provide honest answers.

Reading and Training

To indicate their daily reading habits, participants from both groups provided the following measures. First, *reading time* referred to the participants' self-reported time (minutes) spent reading per day. Second, *self-reported*

reading speed involved the participants' self-estimated everyday reading speed (characters per minute) when they enjoyed reading Japanese books in private. To report reading speed, untrained participants were advised that a typical Japanese paperback includes approximately 500 characters per page on average. Speed-reading trainees were not given this instruction because they were well accustomed to measuring their own reading speeds (characters per minute) during training. Third, reading speeds were measured during the survey, and these were referred to as *measured reading speed*. Specifically, participants were instructed to read through a well-known Japanese novel, *Hashire Melos* (Run, Melos!; 9,795 characters long), written by the novelist Osamu Dazai, once at their normal speed with comprehension. The trainees read the novel printed on separate sheets of A4 paper, while untrained participants read the same content in an identical format by opening a PDF file online. All participants self-measured and provided time spent reading (minutes and/or seconds), which was then used to calculate reading speed in characters per minute.

In addition, trainees of the Park–Sasaki method provided the following measures as indices of the amount of training in speed-reading. First, *training period* referred to the length of period (months) since each trainee started Park–Sasaki training, and second, *training time* involved the trainees' self-reported time (minutes) in which they engaged in speed-reading training per day. Reading time as mentioned above were not included in this measure.

Five Facet Mindfulness Questionnaire

The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) is currently considered one of the most comprehensive measures to explore subjective mindfulness. The questionnaire has five facets: *observing* (noticing or paying attention to external and internal stimuli, e.g., sounds, smells, one's own thoughts, emotions, body sensations); *describing* (verbally stating one's own sensations, emotions, thoughts, etc.); *acting with awareness* (paying attention to one's own behavior at each moment, as opposed to acting in automatic or absent-minded ways); *nonjudging of inner experience* (refraining from evaluating one's own sensations, thoughts, emotions, etc.); and *nonreactivity to inner experience* (allowing thoughts, emotions, images, etc., to come and go without attention getting caught up in them). The FFMQ includes 39 items in total, each of which is rated on a five-point scale, from 1 (*never or very rarely true*) to 5 (*very often or always true*). The present study used the established Japanese version of FFMQ (Sugiura et al., 2012). By involving Japanese university students, Sugiura et al. (2012) demonstrated that the total FFMQ score (α = 0.80) and the scores for all five facets (α = 0.67–0.85) showed acceptable to good reliability. Because the Park–Sasaki method involves focused-attention and self-observation techniques, we expected that the speed-reading training would be positively correlated with total and facet scores on the FFMQ.

Subjective Well-Being Scale

The Subjective Well-Being Scale (SWBS; Ito et al., 2003) was developed in Japan based on the original Subjective Well-Being Inventory (Sell & Nagpal, 1992; Tonan et al., 1995). Ito et al. (2003) demonstrated the reliability of the SWBS for both samples of university/college students and their parents, with a sufficiently high degree of internal consistency (α = 0.84–0.86). The SWBS consists of 15 items, with each being rated on a four-point scale, from 1 (*not at all*, *never*, etc.) to 4 (*very much*, *always*, etc.). Each item belongs to one of the five core dimensions of well-being: *general well-being – positive affect* (generally positive attitudes towards one's own life); *confidence in coping* (confidence to cope with difficult and/or unexpected situations that may occur in life); *expectation-achievement congruence* (feeling of success and achievement as one has expected); *general well-being – negative affect* (generally negative and/or depressed views on one's own life); and *transcendence* (experiences that go beyond ordinary existence, such as moments of bliss or a sense of belonging). Previous studies have suggested that mindfulness is positively associated with multiple dimensions of well-being (Baer et al., 2008; Miyata et al., 2015). We therefore expected that training in speed-reading, parallel to yoga practice (Miyata et al., 2015), would result in higher scores on the SWBS and its subscales.

Beck Depression Inventory

The Beck Depression Inventory (BDI; Beck et al., 1961; 1979) is one of the most widely used psychometric

tests for measuring the symptoms and characteristic attitudes of depression. The BDI has 21 items, each of which concerns symptoms of depression such as sadness, pessimism, guilty feelings, and suicidal thoughts or wishes, as well as physical symptoms such as changes in appetite, tiredness or fatigue, and lack of interest in sex. Each item has four self-evaluative statements, which are scored from 0 to 3. The participant endorses the most relevant statements to these items. For consistency with the other scales, the present survey asked participants to report their recent feelings. The answers to each item are summed to yield a total score. We used the established Japanese version of the BDI (Hayashi, 1988; Hayashi & Takimoto, 1991). Hayashi and Takimoto (1991) reported that the split-half estimate of reliability was 0.62 for a sample of university/college students. As both mindfulness and subjective well-being have been suggested to be negatively associated with depression (Baer et al., 2008; Miyata et al., 2015), we expected that experience in speed-reading training would predict decreases in self-reported depression.

Positive and Negative Affect Schedule

The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) measures subjective affective status in two dimensions: *positive affect* (PA) and *negative affect* (NA). The PANAS is frequently used as a reliable measure of affective status (Crawford & Henry, 2004). The present study used the Japanese version of the PANAS (Sato & Yasuda, 2001). This version has 16 items (emotion terms), each of which is rated on a six-point scale, from 1 (*not true at all*) to 6 (*extremely true*). The PA and NA scores for this version both showed good reliability (α = 0.82–0.91). The present survey asked participants to report their perceived everyday affective status on average. The total PA and NA scores were calculated separately, as is the typical practice of this measure. Consistent with the aforementioned scales, we expected that training in speed-reading would be associated with increased PA and/or decreased NA.

Interpersonal Reactivity Index

The Interpersonal Reactivity Index (IRI; Davis, 1983; see also Davis, 1980) defines empathy as "reactions of one individual to the observed experiences of another (Davis, 1983, p.113)," and taps four separate aspects of trait empathy. The Japanese version of the IRI, which was constructed and validated in a sample of college students (Sakurai, 1988), is composed of the following four subscales: *perspective taking* denotes the tendency to spontaneously adopt the psychological point of view of others; *empathic concern* taps the other-oriented feeling of sympathy and concern for others in unfortunate situations; *fantasy* measures the tendency to transpose oneself imaginatively into feelings and actions of fictitious characters in novels, movies, and so on; and *personal distress* assesses self-oriented feelings of personal anxiety and discomfort in tense interpersonal situations. *Perspective taking* concerns cognitive dimensions of empathy, whereas the other three subscales concern emotional empathy. The total score (α = 0.76) and the scores for the four subscales (α = 0.59–0.75) for the Japanese version of the IRI showed acceptable to good reliability (Miyata et al., 2015). Each subscale is composed of seven items, and all 28 items are rated on a four-point scale, from 1 (*not true at all*) to 4 (*extremely true*). In accordance with the conventions described above, we expected that Park–Sasaki training would be associated with higher empathy.

Data Analysis

All statistical analyses were performed using SPSS Statistics (version 25; IBM, Armonk, NY, U.S.). SPSS Amos (version 25; IBM) was used to conduct a structural equation modeling (SEM) analysis. First, measures regarding reading and training in speed-reading were examined for each group. Missing data for these measures accounted for 0.00–7.55% of the trainees and 0.00–3.00% of the untrained participants; these data were excluded from analysis. For reading time, self-reported reading speed, and measured reading speed, independent samples *t*-tests were used for comparisons between groups. The distributions for all the reading/training measures were positively skewed (skewness = 1.30–4.86 for the trainees, 1.39–6.45 for the untrained participants), so these measures were logarithmically transformed (base 10) in these and subsequent statistical analyses to normalize the distributions. Next, outcomes from the psychological scales were analyzed separately for each group. Besides the mean total scores for all scales, the mean subscale scores were examined for the FFMQ, SWBS, and IRI. Cronbach's alphas

were calculated as a measure of internal consistency for all total and subscale scores. Items with no available data for these scales accounted for 0.00–1.89% of the trainees and 0.00% of the untrained participants; these data were excluded from analysis. For all the total and subscale scores, independent samples *t*-tests were used for comparisons between groups. In addition, Pearson's correlation coefficients (*r* values) were examined between the total scores for all psychological scales to assess the associations between the scores from each scale. These analyses were conducted separately for each group.

A further interest concerned how measures on habits of and/or training in reading were related to mindfulness and relevant psychological status among the population of speed-reading trainees. For this purpose, zero-order correlations (Pearson's *r* values) were first examined between the five reading/training measures and total/subscale scores from the psychological scales for the group of trainees. To clarify the group differences, correlations between the available reading measures, i.e., reading time, self-reported reading speed, and measure reading speed, and total/subscale scores from the psychological scales were also examined for the untrained participants. For the speed-reading trainees, statistically significant correlations between reading/training measures and total scores were found for the FFMQ, SWBS, and PA from the PANAS, so a multiple regression analysis was conducted with each of these total scores as a dependent variable. A major purpose of this analysis was to examine the potential effects of demographic, socioeconomic, and variables other than reading/training on psychological outcomes. After involving reading/training measures that showed statistically significant correlations with the scores using a forced entry method, the following variables were incorporated using a stepwise method: age (years), sex (1 = female, 2 = male), marital status (1 = married, 2 = unmarried), household income (1 = below 2,000,000 Japanese yen, 2 = between 2,000,000–4,990,000 yen, 3 = between 5,000,000–8,990,000 yen, 4 = above 9,000,000 yen), and other activities (1 = yes, 2 = no). Measured reading speed was excluded from this analysis because this measure showed a strong positive correlation with self-reported reading speed ($r = 0.751$, $p < 0.001$) and appeared to be more weakly correlated with scores from the psychological scales.

Finally, an SEM analysis was conducted by involving data from the speed-reading trainees, in order to examine associations between training and skills regarding speed-reading, mindfulness, and relevant psychological outcomes. Variables and scales that had yielded statistically significant outcomes in the multiple regression analyses were involved in the model. Because directions of causal relationships for these measures were not preassumed, we examined multiple causal directions including measures on speed-reading, mindfulness, and desirable psychological status, to compare goodness-of-fit of these models.

Results

Reading and Training

Self-reports from the speed-reading trainees showed that their training period was 7.4 years on average (*SD* = 6.4). These participants accounted for 34.6 minutes of training time per day on average (*SD* = 27.3). **Table 1** shows comparisons between the two groups for the other three reading measures. Reading time was not statistically different between groups, which shows that daily time spent reading was as long for the trainees as that for the untrained participants, except for the time allocated specifically to speed-reading training. Reading speed was significantly higher in the trainees than in the untrained participants, regardless of whether the measure was self-reported or measured during the survey. Untrained participants read the material 2.67 times as fast as their self-reported reading speed during the survey, compared with 1.03 times for the trainees (**Table 1**).

Reliability and Descriptive Statistics

Cronbach' s alphas for the total and subscale scores overall indicated acceptable to good reliability for both groups, although it was relatively low for some scales/subscales, e.g., $\alpha = 0.52$ for the empathic concern subscale of the IRI (trainees). The total/subscale scores from the psychological scales and comparisons between the two groups are further summarized in **Table 2**. With regard to the FFMQ, the total and three subscale scores, i.e., *observing*, *describing*, and *non-reactivity*, were significantly higher for the trainees than for the untrained participants, although

Table 1. Measures regarding reading and group comparisons.

	Speed-reading Trainees (*N*=53)	Untrained Participants (*N*=100)	Comparisons: Speed-reading Trainees vs. Untrained Participants	
	Mean (SD)	Mean (SD)	*t* (*p*)	Cohen's *d*
Reading time (min per day)	48.6 (49.5)	44.3 (40.0)	–0.677 (0.499)	0.12
Self-reported reading speed (characters per min)	3856.9 (5769.6)	712.8 (1110.8)	9.134 (<0.001***)	1.61
Measured reading speed (characters per min)	3980.8 (6850.3)	1901.2 (2197.1)	2.419 (0.018*)	0.45

Means and standard deviations (SDs) are shown for each measure.
*: $p < 0.05$; ***: $p < 0.001$.

Table 2. Descriptive statistics and comparisons between groups for each psychological scale.

	Speed-reading Trainees (*N*=53)		Untrained Participants (*N*=100)		Comparisons: Speed-reading trainees vs. Untrained Participants	
	α	Mean (SD)	α	Mean (SD)	*t* (*p*)	Cohen's *d*
FFMQ total	0.90	128.71 (17.18)	0.84	122.77 (13.38)	2.169 (0.033*)	0.40
Observing	0.75	26.11 (4.62)	0.81	22.85 (5.10)	3.860 (<0.001***)	0.66
Describing	0.94	26.45 (7.01)	0.85	24.25 (5.26)	1.990 (0.0499*)	0.37
Acting with awareness	0.79	27.11 (4.66)	0.83	28.14 (4.67)	–1.312 (0.192)	0.22
Non-judging	0.83	26.38 (5.22)	0.85	27.19 (4.98)	–0.938 (0.350)	0.16
Non-reactivity	0.70	22.66 (3.64)	0.68	20.34 (3.56)	3.779 (<0.001***)	0.65
SWBS total	0.92	45.03 (7.55)	0.89	41.87 (7.05)	2.564 (0.011*)	0.44
General well-being: positive affect	0.82	9.79 (1.63)	0.85	8.92 (1.79)	2.942 (0.004**)	0.50
Confidence in coping	0.86	9.71 (1.74)	0.86	8.97 (1.75)	2.504 (0.013*)	0.42
Expectation-achievement congruence	0.72	8.40 (1.82)	0.75	8.28 (1.82)	0.374 (0.709)	0.07
General well-being: negative affect[a]	0.85	8.91 (2.08)	0.80	8.05 (2.06)	2.421 (0.017*)	0.42
Transcendence	0.78	8.23 (1.89)	0.63	7.65 (1.86)	1.801 (0.074)	0.31
BDI total	0.75	6.85 (4.78)	0.90	9.71 (8.51)	–2.636 (0.009**)	0.38
PANAS: PA	0.89	30.60 (6.51)	0.87	27.80 (6.48)	2.503 (0.013*)	0.43
PANAS: NA	0.87	21.71 (7.06)	0.84	22.38 (6.28)	–0.592 (0.555)	0.10
IRI total	0.66	76.96 (6.10)	0.81	71.63 (8.32)	4.483 (<0.001***)	0.70
Perspective taking	0.71	20.29 (2.85)	0.79	18.86 (3.30)	2.677 (0.008**)	0.45
Empathic concern	0.52	20.49 (2.18)	0.71	18.69 (3.02)	4.209 (<0.001***)	0.65
Fantasy	0.71	20.14 (3.12)	0.70	18.16 (3.28)	3.613 (<0.001***)	0.61
Personal distress	0.74	16.03 (3.29)	0.74	15.92 (3.18)	0.214 (0.831)	0.03

Mean total/subscale scores and standard deviations (SDs) are shown for each scale. *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$.
[a]: Higher scores indicate less self-reported negative affect.

no statistically significant differences between groups were observed for the *acting with awareness* and *non-judging* subscales. For the SWBS, the total and all subscale scores except that for *expectation-achievement congruence* were significantly higher for the trainees than for the untrained participants. The BDI score was consistently significantly lower for the trainees than for the untrained participants. Regarding the PANAS, the trainees showed significantly higher scores than the untrained participants for PA, whereas no statistically significant differences were observed between groups for NA. Finally, the total and three subscale scores of the IRI were significantly higher for the trainees than for the untrained participants, except the scores for the *personal distress* subscale. Taken together, these data show that the speed-reading trainees self-reported more desirable psychological statuses than the untrained participants, including showing larger scores for *mindfulness*, *subjective well-being*, *positive affect*, and *empathy*, and lower scores for *depression*. By contrast, the scores on some subscales, e.g., the *personal distress* subscale of the IRI, were statistically equivalent, regardless of whether the participants had engaged in speed-reading training.

Correlations between Psychological Scales

For the trainees, the FFMQ scores showed significant positive correlations with the SWBS scores and PA scores on the PANAS, and negative correlations with the BDI scores and NA scores on the PANAS (**Table 3**). Consistently, SWBS scores showed significant positive correlations with the PA scores on the PANAS, and negative correlations with the BDI score and the NA score on the PANAS. The BDI score also showed significant positive/negative correlations with the NA/PA scores on the PANAS, respectively. In addition, the PA and NA scores on the PANAS showed significant negative correlations with each other. By contrast, the IRI scores failed to show statistically significant correlations with scores from the other scales, except that these scores were significantly positively correlated with the NA scores on the PANAS for the trainees. These correlations were generally similar for the untrained participants, with a few exceptions, such as the non-significant negative correlation between FFMQ and BDI scores (**Table 3**). These correlations overall show that both the desirable and non-desirable aspects of psychological status were associated with each other, regardless of whether the participants had engaged in speed-reading training.

Table 3. Correlations between the total scores for the psychological scales, presented for each group of participants.

		SWBS	BDI	PANAS: PA	PANAS: NA	IRI
Speed-reading Trainees	FFMQ	**0.654*****	**–0.462*****	**0.507*****	**–0.518*****	0.171
	SWBS	—	**–0.631*****	**0.618*****	**–0.636*****	0.002
	BDI		—	**–0.523*****	**0.589*****	0.093
	PANAS: PA			—	**–0.289***	0.152
	PANAS: NA				—	**0.280***
Untrained Participants	FFMQ	**0.321****	–0.195	**0.494*****	**–0.492*****	0.081
	SWBS	—	**–0.686*****	**0.503*****	**–0.401*****	0.111
	BDI		—	**–0.338*****	**0.450*****	–0.191
	PANAS: PA			—	**–0.207***	0.147
	PANAS: NA				—	0.013

Pearson's correlation coefficients (*r* values) are shown for each comparison. Statistically significant correlations are shown in bold.
*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$.

Reading/Training and Psychological Outcomes

Table 4 summarizes Pearson's correlation coefficients found between the reading/training measures and scores from the psychological scales. Training period, self-reported reading speed, and measured reading speed (to a lesser extent) showed statistically significant positive correlations with the total and multiple subscale scores of the FFMQ and SWBS. Self-reported reading speed and reading time per day were also significantly positively correlated with the PA scores on the PANAS. By contrast, reading time and training time measures generally failed to show strong correlations with these scores. In addition, scores from the BDI, the NA on the PANAS, and the IRI overall did not show significant correlations with the reading/training measures, except for a few significant correlations found between the subscale scores of the IRI. These data show that measures relevant to speed-reading training, such as training period and reading speed, were associated with more desirable psychological functions, including mindfulness, well-being, and positive affect, although associations with non-desirable psychological outcomes were overall not apparent.

For the untrained participants, correlations between the reading measures, i.e., *reading time*, *self-reported reading speed*, and *measured reading speed*, and scores from the psychological scales were examined. Both total and subscale scores from the psychological scales failed to show statistically significant correlations with the reading measures (total scores: r = -0.150–0.158, all $ps > 0.141$; subscale scores: r = -0.213–0.215, all $ps > 0.050$), with the exception of a few significant correlations found for the subscale scores. These correlations were: the nonreactivity subscale scores from the FFMQ were significantly positively correlated with reading time ($r = 0.252$, $p = 0.021$). Empathic concern subscale scores from the IRI were significantly negatively correlated with self-reported reading

Table 4. Zero-order correlations between reading/training measures and total/subscale scores from the psychological scales among the speed-reading trainees.

	Training period (months)	Training time (min per day)	Reading time (min per day)	Self-reported reading speed (characters per min)	Measured reading speed (characters per min)
FFMQ total	**0.431****	0.142	0.180	**0.415****	**0.325***
Observing	**0.556*****	0.019	0.050	**0.386****	**0.322***
Describing	**0.344***	0.061	0.193	**0.399****	0.242
Acting with awareness	**0.406****	0.132	–0.041	**0.350***	0.180
Non-judging	–0.068	0.129	0.221	–0.051	0.079
Non-reactivity	0.244	0.170	0.154	**0.357***	**0.315***
SWBS total	**0.273***	–0.004	0.182	**0.364***	0.214
General well-being: positive affect	**0.314***	0.073	0.098	**0.365****	0.165
Confidence in coping	0.050	0.009	**0.301***	**0.337***	0.218
Expectation-achievement congruence	**0.340***	–0.210	0.023	0.266	0.170
General well-being: negative affect[a]	0.099	0.180	0.224	0.191	–0.027
Transcendence	**0.337***	–0.071	0.098	**0.352***	**0.380****
BDI total	0.136	–0.229	–0.275	–0.168	0.006
PANAS: PA	0.022	0.052	**0.340***	**0.341***	0.189
PANAS: NA	–0.101	–0.102	–0.268	–0.175	0.034
IRI total	0.202	–0.084	–0.062	0.125	0.167
Perspective taking	**0.346***	–0.063	–0.075	**0.347***	**0.346***
Empathic concern	0.066	–0.003	0.163	0.244	0.084
Fantasy	0.008	–0.056	0.174	–0.082	0.075
Personal distress	0.029	–0.063	**–0.326***	–0.153	–0.105

Pearson's correlation coefficients (*r* values) are shown for each comparison. Statistically significant correlations are shown in bold.
*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$. [a]: Higher scores indicate less self-reported negative affect.

Table 5. Results of multiple regression analyses for the total scores of the FFMQ and SWBS, and PA scores of the PANAS.

Independent variable	FFMQ total			SWBS total		
	B (*SE*)	*β*	*t* (*p*)	*B* (*SE*)	*β*	*t* (*p*)
(Constant)	88.401 (16.918)	—	5.225 (<0.001***)	35.797 (7.416)	—	4.827 (<0.001***)
Training period	11.813 (4.680)	0.332	2.524 (0.015*)	2.286 (2.052)	0.147	1.114 (0.271)
Self-reported reading speed	10.349 (5.009)	0.270	2.066 (0.045*)	4.638 (2.196)	0.278	2.112 (0.040*)
Marital status	–10.918 (4.269)	–0.308	–2.557 (0.014*)	–7.129 (1.871)	–0.462	–3.809 (<0.001***)
R^2	0.386			0.378		
Adjusted R^2	0.343			0.334		
F	9.008***			8.703***		

Independent variable	PANAS: PA		
	B (*SE*)	*β*	*t* (*p*)
(Constant)	8.626 (7.521)	—	1.147 (0.258)
Reading time	7.503 (2.492)	0.372	3.011 (0.004**)
Self-reported reading speed	4.579 (1.700)	0.331	2.694 (0.0101*)
Marital status	–3.763 (1.606)	–0.290	–2.343 (0.024*)
R^2	0.369		
Adjusted R^2	0.324		
F	8.812***		

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$.

speed (r = -0.202, p = 0.048). General well-being – negative affect subscale scores from the SWBS were significantly negatively correlated with measured reading speed (r = -0.221, p = 0.027). These correlation trends are less apparent than those for the speed-reading trainees, and show that daily reading time and speed measures overall fail to relate to mindfulness and psychological status among those with no training of speed-reading.

Results from the further multiple regression analyses involving the speed-reading trainees are shown in **Table 5**. As shown in the table, the results of these three regression models proved to be statistically significant. Both training period and self-reported reading speed showed significant positive associations with the FFMQ and SWBS total scores. Both reading time and self-reported reading speed showed significant positive associations with PA scores on the PANAS. Marital status, but not the remaining demographic, socioeconomic, or other variables, showed significant associations with the scores on all these three psychological scales. These results show that measures related to speed-reading significantly predict higher mindfulness, subjective well-being, and positive affect, even though the state of being married is also significantly associated with a more desirable psychological status.

Structural Equation Modeling

To further examine associations between speed-reading, mindfulness, and desirable psychological status, we examined SEM models involving training period and self-reported reading speed as indices of reading/training in speed-reading, total scores of the FFMQ as mindfulness, and the SWBS and PA from the PANAS as desirable psychological status. Data from the population of speed-reading trainees were involved in these analyses. First, a model assuming causal directions from speed-reading to mindfulness and then to desirable psychological status was considered, by including all the paths in these causal directions and covariance between training period and self-reported reading speed, and between error terms of the SWBS and PA (CFI = 1.000, RMSEA = 0.299, AIC = 40.000). We next removed non-significant paths, i.e., training period to the SWBS (β= -0.042, p = 0.723), training period to the PA (β = -0.225, p = 0.053), self-reported reading speed to the SWBS (β = 0.121, p = 0.324), and self-reported reading speed to the PA (β = 0.228, p = 0.088). Then we fit the model shown in **Figure 1**. This model showed a good/acceptable fit ($\chi^2(4)$ = 6.415, p = 0.170, CFI = 0.965, RMSEA = 0.108, AIC = 38.415), with all the paths being statistically significant. Second, an alternative model assuming opposite causal directions from desirable psychological status to mindfulness and then to speed-reading was examined. In the same ways as above, we first included all the paths and covariances (CFI = 1.000, RMSEA = 0.299, AIC = 40.000), and then removed non-significant paths, i.e., the SWBS to training period/self-reported reading speed, the PA to the FFMQ/training period/self-reported reading speed, the FFMQ to self-reported reading speed (β = -0.305–0.284, all ps > 0.051), and covariance, i.e., between error terms of training period and self-reported reading speed (r = 0.279, p = 0.061). This model showed a poorer fit than the one above as shown in **Figure 1** ($\chi^2(7)$ = 20.499, p = 0.005, CFI = 0.806, RMSEA = 0.193, AIC = 46.499). Finally, we also examined another alternative model assuming causal directions from mindfulness to speed-reading and then to desirable psychological status. Following the conventions as above, all the

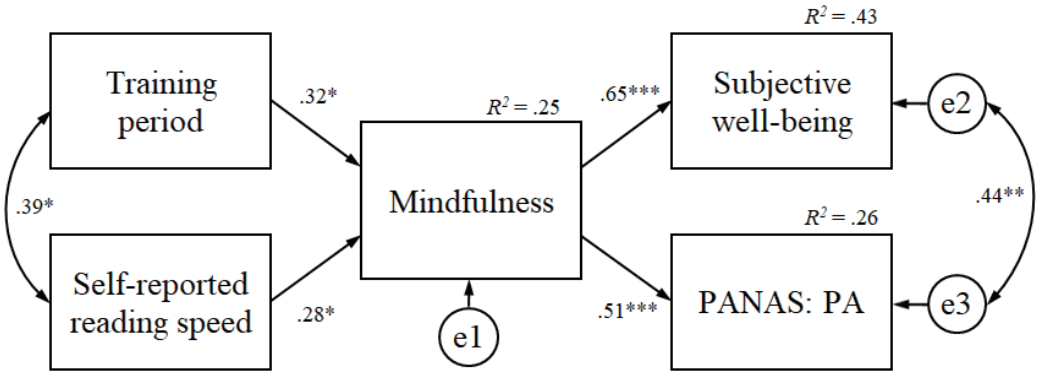

Figure 1. An SEM model involving measures relevant to speed-reading, mindfulness, and psychological outcomes.
*: p < 0.05; **: p < 0.01; ***: p < 0.001.

paths and covariances were first included ($\chi^2(2) = 24.227$, $p < 0.001$, CFI = 0.681, RMSEA = 0.462, AIC = 60.227), before non-significant paths i.e., training period to the SWBS/PA (β = -0.120–0.152, all $ps > 0.272$), and covariance, i.e., between error terms of training period and self-reported reading speed ($r = 0.249$, $p = 0.091$) were removed. The model again showed a poorer fit than the one in **Figure 1** ($\chi^2(5) = 31.728$, $p < 0.001$, CFI = 0.617, RMSEA = 0.321, AIC = 61.728). Based on these analyses, we adopted the model in **Figure 1** as the final model.

Discussion

The present study examined mindfulness and relevant psychological status in trainees of a meditation-based speed-reading method in Japan, based on a previous study involving Japanese yoga practitioners (Miyata et al., 2015). Consistent with the hypotheses, compared with the untrained participants, the speed-reading trainees self-reported significantly higher scores on mindfulness, subjective well-being, positive affect, and empathy, and lower scores on depression. The trainees also showed significantly higher reading speeds than the untrained participants, regardless of whether the measure was self-reported or measured during the survey, although no significant difference in reading time per day was observed between the two groups. For both groups, statistically significant correlations were found between the total scores from the psychological scales, which shows that desirable and non-desirable psychological functions are associated with each other. Among the trainees, both training period and reading speed positively predicted mindfulness and subjective well-being, and both reading time and speed predicted higher scores for PA. For the untrained participants, reading time/speed generally failed to show significant associations with scores from the psychological scales. For the trainees, the demographic, socioeconomic, and other variables generally failed to influence psychological outcomes significantly, except that the state of being married was significantly associated with a more desirable psychological status. Considering these data together with the final SEM model (**Figure 1**), the results are consistent with the notion that not only the period of continued training, but also higher reading speeds acquired through training, led to higher mindfulness, which resulted in a more desirable psychological status such as higher subjective well-being and PA among the populations of the speed-reading trainees.

Overall, the results of the present study are similar to those from the abovementioned study involving Japanese yoga practitioners (Miyata et al., 2015), in which period and/or amount of yoga/meditation practice were significantly associated with higher mindfulness and a desirable psychological status. The results from these two studies suggest a common effect of continued contemplative training on desirable psychological outcomes across multiple training methods, including those that intend to enhance higher intellectual capabilities such as reading. These results also seem to add consistent and novel evidence in support of the notion that mindfulness has significant correlates with capabilities relevant to reading (e.g., Mrazek et al., 2013; Paris et al., 1991; Rhoder, 2002). With regard to the Park–Sasaki method, the meditation-based nature of the training and higher cognitive processing associated with reading seem inseparable because the entire training program is based on forming a meditative mental state through traditional breathing and other techniques (Miyata, 2015; Sasaki, 1995). Thus, it could be a beneficial way forward to compare a contemplative method with no reading training and another non-contemplative technique with reading training, if these aspects of expertise are to be differentiated from each other.

By contrast, several aspects of the present results were not totally supportive of our hypothesis. First, the trainees failed to show an apparent decrease in non-desirable psychological functions such as depression and NA associated with speed-reading training (**Table 4**). This finding may reflect the fact that the Park–Sasaki method primarily focuses on relaxation, focused-attention, and self-observation, comparable to mindfulness, but does not necessarily stress the importance of observing one's negative thoughts and/or pain, as do the MBSR and MBCT programs (Kabat-Zinn, 1990; Segal et al., 2002). Second, among the trainees, some of the reading/training measures failed to show strong associations with psychological status, including reading time and training time per day (**Table 4**). This may be because these measures had large variations within each trainee and were difficult to be self-reported precisely. In addition, reading speed measured during the survey was more weakly associated with psychological status than was self-reported reading speed. For the untrained participants, measured reading speed

was obviously higher than self-reported reading speed (**Table 1**). These data suggest that experimental reading situations may urge participants to exhibit better performance, despite the instruction to read at their normal speeds. It also seems plausible that the untrained participants wished to finish the survey quickly, regardless of whether they understood the content of the story. It may be better to instruct participants to keep a record of the content and amount of what they read within a certain period of time. Third, the IRI overall failed to show apparent correlations with scores from the other scales or reading/training measures (**Tables 3 and 4**). These trends are similar to those from the abovementioned study with yoga practitioners (Miyata et al., 2015); however, statistically significant correlations with reading/training measures were observed for several subscale scores. Specifically, the subscale scores for *perspective taking* showed significant positive correlations with training period and reading speed (**Table 4**). This seems parallel to the idea that components of mindfulness, such as observing and acting with awareness (Baer et al., 2006; Sugiura et al., 2012), can overlap with suggested components of empathy, such as executive control and metacognition (Decety & Lamm, 2006). In addition, reading time per day was significantly negatively correlated with *personal distress* subscale scores, which appears consistent with the notion that at least a certain negative aspect of psychological functions can be reduced as a result of speed-reading training.

Despite the novel findings and perspectives described above, the present study does have important limitations. The first issue to note concerns the cross-sectional design. As mentioned above, this design is undoubtedly beneficial in that it can assess psychological status in a large number of trainees with long-term training and at various stages of expertise at one point of time (Miyata et al., 2015; Slagter et al., 2011). However, it is difficult to exclude completely alternative explanations, for example, that speed-reading trainees who continued the training longer and achieved higher stages of expertise had shown desirable psychological status and higher mindfulness when they had started the training. These alternative models were not adopted within the present dataset; however, in order to model the effect of training on psychological/cognitive outcomes in more convincing ways, a longitudinal design should essentially be employed in the subsequent stages of enquiry. These intervention studies may compare changes in mindfulness, psychological status, and/or cognitive capabilities after untrained participants engage in training for a determined period of time, e.g., several days, weeks, or months, and examine moderating/mediating effects of mindfulness on the relationships between speed-reading training and enhancement of desirable psychological status and/or cognitive capabilities relevant to reading.

Another limitation of the present study relates to the fact that the levels of sentence comprehension associated with the speed-reading training were not addressed quantitatively within the framework of this study, other than the trainees' self-reports and measurements of time required to read a well-known sentence. To our knowledge, Miyata et al. (2012) is the only study to demonstrate a case of an advanced Park–Sasaki expert showing a reduced speed–accuracy trade-off at high reading speeds. Future studies may prioritize behavioral experiments to obtain more convincing evidence regarding reading comprehension by speed-reading trainees. These efforts could help overcome the critical literature in the West claiming that speed-reading is at most skilled skimming or scanning, and is not effective in terms of reducing the speed–accuracy trade-off (for a recent review, see Rayner et al., 2015).

Given that the results of the present study suggest that speed-reading and yoga have similar psychological correlates, one perspective for future enquiries should be to investigate a wider variety of traditional contemplative practices and somatics in Japan (Kubo, 2011; Yuasa, 1987), such as martial arts, Zen and Tendai Buddhism, qigong, osteopathy, and massage. By applying a similar study design to these different populations of practitioners, it would be possible to uncover both similarities and differences regarding how these practices influence mindfulness and psychological status. Within these contexts, it is also essential to accumulate further convincing empirical data regarding speed-reading at both the behavioral and neurophysiological levels (Miyata, 2015). In addition, assuming that reading can have similar correlates to mindfulness (Miyata, 2016; Mrazek et al., 2013), it could also be promising to further investigate relationships between reading habits and mindfulness/psychological status among those with no training in speed-reading or meditaiton. These correlations were not apparent in the present data from untrained participants, but could be further uncovered if those with substantial amount of daily reading and those with no reading habits are to be directly compared. These efforts should allow an integrated perspective to be obtained between contemplative practices or mindfulness at the first-person level and empirical psychological and

neuroscientific studies at the third-person level from a Japanese standpoint.

Acknowledgments. This study was supported by the Grant-in-Aid for Young Scientists (B) No. 26730077 from the Japan Society for the Promotion of Science (JSPS) to Hiromitsu Miyata, and partially by a Waseda University Grant for Special Research Projects to Hiromitsu Miyata (Project number: 2019C-072).

References

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, **13**, 27–45.

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., et al. (2008). Construct validity of the five facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment*, **15**, 329–342.

Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression*. New York, NY: The Guilford Press.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J. E., & Erbaugh, J. K. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, **4**, 561–571.

Crawford, J. R., & Henry, J. D. (2004). The Positive and Negative Affect Schedule (PANAS): Construct validity, measurement properties and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, **43**, 245–265.

Creswell, J. D. (2017). Mindfulness interventions. *Annual Review of Psychology*, **68**, 491–516.

Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology*, **10**, 85.

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology*, **44**, 113–126.

Davis, D. M., & Hayes, J. A. (2011). What are the benefits of mindfulness? A practice review of psychotherapy-related research. *Psychotherapy*, **48**, 198–208.

Decety, J., & Lamm, C. (2006). Human empathy through the lens of social neuroscience. *The Scientific World Journal*, **6**, 1146–1163.

Fujimaki, N., Hayakawa, T., Munetsuna, S., & Sasaki, T. (2004). Neural activation dependent on reading speed during covert reading of novels. *Neuroreport*, **15**, 239–243.

Fujimaki, N., Munetsuna, S., Sasaki, T., Hayakawa, T., Ihara, A., Wei, Q., et al. (2009). Neural activations correlated with reading speed during reading novels. *Neuroscience Research*, **65**, 335–342.

Goyal, M., Singh, S., Sibinga, E. M. S., Gould, N. F., Rowland-Seymour, A., Sharma, R., et al. (2014). Meditation programs for psychological stress and well-being: A systematic review and meta-analysis. *JAMA Internal Medicine*, **174**, 357–368.

Hayashi, K. (1988). Study on depressive states of students based on Beck's cognitive therapy. *Student Counseling Journal*, **9**, 97–107 (in Japanese).

Hayashi, K., & Takimoto, T. (1991). An examination of Beck Depression Inventory (1978) and an analysis of relation between depressive tendencies and grade of self-efficacy. *Memoires of Shiraumegakuen College*, **27**, 43–52 (in Japanese).

Ito, Y., Sagara, J., Ikeda, M., & Kawaura, Y. (2003). Reliability and validity of Subjective Well-Being Scale. *The Japanese Journal of Psychology*, **74**, 276–281 (in Japanese).

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness*. New York, NY: Delacorte.

Kato, M., Kuriyama, M., Ueda, K., Sasaki, T., Atsumori, H., Kawaguchi, H., et al. (2005). The effect of reading speed on visual search task. *Proceedings of the 27th Annual Conference of the Cognitive Science Society*, 1102–1107.

Kawano, K., & Sasaki, T. (2005). EEGs and other physiological changes with progression of reading speed. *Journal of International Society of Life Information Science*, **23**, 174–178.

Kubo, T. (2011). *Somatic sinrigaku (Somatic psychology)*. Tokyo: Shunjusha (in Japanese).

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences*, **12**, 163–169.

Miyata, H. (2015). Psychological studies of speed-reading as a contemplative training method. *The AGU Journal of Psychology*, **15**, 77–90.

Miyata, H. (2016). Effects of reading time and speed on mindfulness and psychological status: Evidence from a Japanese sample. *The AGU Journal of Psychology*, **16**, 45–54.

Miyata, H., Minagawa-Kawai, Y., Watanabe, S., Sasaki, T., & Ueda, K. (2012). Reading speed, comprehension and eye movements while reading Japanese novels: Evidence from untrained readers and cases of speed-reading trainees. *PLoS One*, **7**, e36091.

Miyata, H., Watanabe, S., Ueda, K. Sasaki, T., & Minagawa, Y. (2016). *Enhanced visual form and visuo-spatial processes in Japanese speed-reading experts: A preliminary analysis* (Report No. JCSS-TR-74). Nagoya, Japan: Japanese Cognitive Science Society.

Miyata, H., Okanoya, K., & Kawai, N. (2015). Mindfulness and psychological status of Japanese yoga practitioners: A cross-sectional study. *Mindfulness*, **6**, 560–571.

Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory

capacity and GRE performance while reducing mind wandering. *Psychological Science*, **24**, 776–781.

Muraki, H. (2001). *Manbyo wo iyasu tanden kokyu ho* [Tandem breathing method that heals all kinds of diseases]. Tokyo, Japan: Shunjusha.

Paris, S. G., Wasik, B., & Turner, J. C. (1991). The development of strategic readers. In: R. Barr, M. L. Kamil, P. B. Mosenthal, & P. D. Pearson (Eds.), *Handbook of reading research, Vol. 2*. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 609–640.

Pawlow, L. A., & Jones, G. E. (2002). The impact of abbreviated progressive muscle relaxation on salivary cortisol. *Biological Psychology*, **60**, 1–16.

Pawlow, L. A., & Jones, G. E. (2005). The impact of abbreviated progressive muscle relaxation on salivary cortisol and salivary immunoglobulin A (sIgA). *Applied Psychophysiology and Biofeedback*, **30**, 375–387.

Rayner, K., Schotter, E. R., Masson, M. E. J., Potter, M. C., & Treiman, R. (2015). So much to read, so little time: How do we read, and can speed reading help? *Psychological Science in the Public Interest*, **17**, 4–34.

Rhoder, C. (2002). Mindful reading: Strategy training that facilitates transfer. *Journal of Adolescent & Adult Literacy*, **45**, 498–512.

Sakurai, S. (1988). The relationship between empathy and helping behavior in college students. *Bulletin of Nara University of Education, Cultural and Social Science*, **37**, 149–154 (in Japanese).

Sasaki, T. (1995). *Sokudoku no kagaku* [The science of speed-reading]. Tokyo, Japan: Kobunsha.

Sato T., & Yasuda, A. (2001). Development of the Japanese version of positive and negative affect schedule (PANAS) scales. *The Japanese Journal of Personality*, **9**, 138–139 (in Japanese).

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2002). *Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse*. New York, NY: The Guilford Press.

Sell, H., & Nagpal, R. (1992). *Assessment of subjective well-being: The subjective well-being inventory (SUBI)*. New Delhi, India: Regional Office for South-East Asia, World Health Organization.

Slagter, H. A., Davidson, R. J., & Lutz, A. (2011). Mental training as a tool in the neuroscientific study of brain and cognitive plasticity. *Frontiers in Human Neuroscience*, **5**, 17.

Sugiura, Y., Sato, A., Ito, Y., & Murakami, H. (2012). Development and validation of the Japanese version of the Five Facet Mindfulness Questionnaire. *Mindfulness*, **3**, 85–94.

Tonan, K., Sonoda, A., & Ono, Y. (1995). Production of the subjective well-being inventory Japanese edition: Its reliability and validity. *Japanese Journal of Health Psychology*, **8**, 12–19 (in Japanese).

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, **54**, 1063–1070.

Yuasa, Y. (1987). *The body: Toward an Eastern mind–body theory*. New York, NY: SUNY Press.